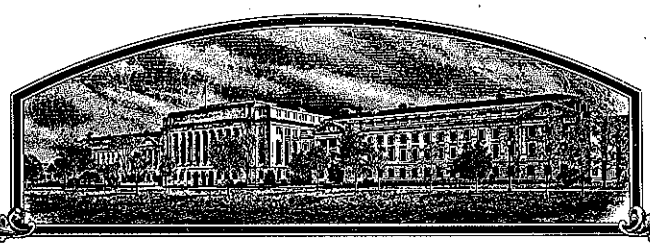

No. 9600260

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Virginia Agricultural Experiment Station

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED, PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE URPOSES, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED HE PLANT VARIETY PROTECTION ACT. IN THE UNITED STATES SEED OF THIS VARIETY (1) SHALL D BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF IONS SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WINTER FEED BARLEY

'Callao'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this twenty-ninth day of August in the year of our Lord one thousand nine hundred and ninety-seven.

Attest:

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Secretary of Agriculture

REPRODUCE LOCALLY. *Include form number and date on all reproductions.* FORM APPROVED - OMB NO. 0581-0C

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE DIVISION - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act 1974 (5 U.S.C. 552a).

Application is required in order to determine if a plant variety protecti certificate is to be issued (7 U.S.C. 2421). Information is held confident until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) *(as it is to appear on the Certificate)*
Virginia Agricultural Experiment Station

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER
VA 90-41-14

3. VARIETY NAME
Callao

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*
Virginia Polytechnic Institute and State Univ.
College of Agriculture and Life Sciences

5. TELEPHONE *(include area code)*
540-231-3766

6. FAX *(include area code)*
540-231-4163

FOR OFFICIAL USE ONLY

PVPO NUMBER: 9600260

FILING DATE: May 22, 1996

FEES RECEIVED — FILING AND EXAMINATION FEE: $ 2150.23 DATE: 2-14-96

CERTIFICATION FEE: $ 300.00 DATE: 5 August 1997

7. GENUS AND SPECIES NAME
Hordeum vulgare L.

8. FAMILY NAME *(Botanical)*
Gramineae

9. CROP KIND NAME *(Common name)*
Winter Feed Barley

10. IF THE APPLICANT NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION *(corporation, partnership, association, etc.)* *(Common name)*
Agricultural Experiment Station of Virginia Tech

11. IF INCORPORATED, GIVE STATE OF INCORPORATION

12. DATE OF INCORPORATION

13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS
Carl A. Griffey
Crop and Soil Environmental Sciences
Virginia Tech
Blacksburg, VA 24061-0404

14. TELEPHONE *(include area code)*
540-231-9789

15. FAX *(include area code)*
540-231-3431

16. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED *(Follow instructions on reverse)*

a. ☒ Exhibit A. Origin and Breeding History of the Variety
b. ☒ Exhibit B. Statement of Distinctness
c. ☒ Exhibit C. Objective Description of the Variety
d. ☒ Exhibit D. Additional Description of the Variety
e. ☒ Exhibit E. Statement of the Basis of the Applicant's Ownership
f. ☒ Voucher Sample *(2,500 viable untreated seeds or, for tuber propagated varieties verification that tissue culture will be deposited and maintained in a public repository)*
g. ☒ Filing and Examination Fee ($2,450), made payable to "Treasurer of the United States" *(Mail to PVPO)*

17. DOES THE APPLICANT SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY, AS A CLASS OF CERTIFIED SEED? *(See Section 83(a) of the Plant Variety Protection Act)?*
☒ YES *(If "yes," answer items 18 and 19 below)* ☐ NO *(If "no," go to item 20)*

18. DOES THE APPLICANT SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?
☒ YES ☐ NO

19. IF "YES" TO ITEM 18, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED?
☒ FOUNDATION ☒ REGISTERED ☒ CERTIFIED

20. HAS THE VARIETY OR A HYBRID PRODUCED FROM THE VARIETY BEEN RELEASED, USED, OFFERED FOR SALE, OR MARKETED IN THE U.S. OR OTHER COUNTRIES?
☒ YES *(If "yes," give names of countries and dates)* ☐ NO
Foundation seed was sold to certified seed growers in Fall 1995, and certified seed will be sold to producers in the U.S.A. in Fall 1996.

21. The applicant(s) declare that a viable sample of basic seed of the variety will be furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.

The undersigned applicant(s) is(are) the owner(s) of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 41, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.

Applicant(s) is(are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF APPLICANT *(Owner(s))*		SIGNATURE OF APPLICANT *(Owner(s))*	
R. Q. Cannell			
NAME *(Please print or type)*		NAME *(Please print or type)*	
R. Q. Cannell			
CAPACITY OR TITLE	DATE	CAPACITY OR TITLE	DATE
Director, VAES	1/22/1996		/

SD-470 (04-95) *(Previous editions are to be destroyed)* *(See reverse for instructions and information collection burden statement)*

9600260

Callao Barley

14A. Exhibit A: Origin and Breeding History

Genealogy and Breeding History. The parentage of Callao winter barley is 'Boone'/'Henry'//'Sussex'. The series of crosses from which Callao was derived was completed in the Spring of 1981.

Selection and Advancement of the Variety. The segregating generations of the cross were advanced to the F_5 using a modified bulk breeding method. Callao was selected in 1987 as an F_6 headrow. Following two years of preliminary tests in replicated yield trials, Callao was advanced as VA 90-41-14 to Virginia's statewide yield trials and was tested for five years (1991-1995). Callao was tested regionally for three years (1992-1994) in the Uniform Winter Barley Yield Nursery.

Multiplication and Purification. Within the limits of biological expectation, Callao has remained stable and uniform in composition through nine generations of selfing. The breeder seed of Callao barley was developed during the 1993 and 1994 growing seasons. In 1993, 276 of 300 individual headrows were selected (92%) in the field based on homogeneity and trueness to phenotype. These 276 headrows were harvested individually and each planted in 45 sq ft plots with 2 reps per entry or 552 total plots. Based on visual observations in the field and disease reactions in the greenhouse, plots lacking uniformity (heterogeneous) or trueness to phenotype were discarded. Of these 552 plots, 300 were selected (54%) and combine-harvested in bulk to form the breeder seed of Callao. From certification of foundation seed fields, a very low percentage of variant types, consisting of not more than 0.05% of predominantly tall plants was detected. Nonetheless, Callao is genetically stable in the sense that the variety can be maintained and reproduced via seed without changing its characteristics.

9600260

Callao Barley

14B. Exhibit B: Novelty Statement

Callao is uniquely different from all known barley cultivars, but is most similar to 'Boone' barley. Callao has a closed collar, while Boone has an open collar. Callao has overlapping lateral kernels, while Boone does not. Glumes of Callao have hairs confined to bands, while those of Boone are covered. Lemmas of Callao have several teeth on lateral and marginal nerves, while those of Boone lack teeth. Callao has long-haired rachillas, while those of Boone are short. Spike emergence of Callao was 6 (1994) to 10 d (1995) earlier than Boone and significantly (ANOVA L.S.D. @ 0.05: $\leq$ 2 days) different in statewide trials conducted in 18 environments from 1991-95 (Tables 1-5). Plant height of Callao was 6 to 8 inches shorter than Boone and significantly (ANOVA L.S.D. @ 0.05: $\leq$ 2 inches) different in 1991-95 trials in 16 environments. Callao is moderately resistant (infection type=1 on 0-4 scale) to powdery mildew, while Boone is susceptible (infection type=3). Seedlings of Callao are susceptible (infection type=3 on 0-4 scale) to race 8 of barley leaf rust, while those of Boone are resistant (infection type= ;1-cn).

Table 1. Summary of performance of entries in the State Barley Test, 1990-91.*

Brand/Variety	Yield (Bu/A)	Test Weight (Lb)	Date Headed (Mar 31+)	Height (In)	Lodging (0 - 100 %)	Powdery Mildew (%)**	Leaf Rust (%)**
	(5)	(5)	(4)	(3)	(4)	(2)	(3)
CALLAO	107+	51.0+	8	32	60	0	7 -
BOONE	84 -	46.5 -	17	39	25	14+	34+
PAMUNKEY	107+	51.3+	9	38	27+	0	20+
NOMINI	107+	48.3	9	40	17	0	15
STARLING	108+	48.5	13	39	13 -	0	7 -
WYSOR	92	48.5	11	39	22	0	21+
BARSOY	76 -	49.8+	8	35	21	43+	75+
LSD (0.05)	8	0.7			6	2	2
Test Average	96	48.8	13	38	21	3	15

* The number in parentheses below column headings indicates the number of locations on which data are based. A plus or minus sign indicates a performance significantly above or below the test average, respectively.

** Disease severity was assessed based on percent (0 - 100%) leaf area infected.

Table 2. Summary of performance of entries in the State Barley Test, 1991-92.*

Brand/Variety	Yield (Bu/A)	Test Weight (Lb)	Date Headed (Mar 31+)	Height (In)	Lodging (0 - 100 %)	Powdery Mildew (%)**	Leaf Rust (0-10)+
	(5)	(4)	(3)	(2)	(3)	(2)	(1)
CALLAO	120+	50.7+	15 -	32 -	48+	0	5 -
BOONE	107 -	48.6	22+	39+	41+	36+	10+
PAMUNKEY	124+	53.2+	18	37	26	0	8
NOMINI	125+	49.1	18	39+	23	0	6 -
STARLING	127+	48.4	20+	39+	22	0	4 -
WYSOR	118	49.0	20+	39+	23	0	10+
BARSOY	91 -	49.7	16 -	35 -	6 -	21+	10+
LSD (0.05)	6	1.2	2	2	13	9	2
Test Average	114	49.2	18	36	22	4	8

* The number in parentheses below column headings indicates the number of locations on which data are based. A plus or minus sign indicates a performance significantly above or below the test average, respectively.

** Disease severity was assessed based on percent (0 - 100%) leaf area infected.

+ Disease severity was assessed based on a 0-10 scale, where 0=no disease and 10=near 100% leaf area infected.

Table 3. Summary of performance of entries in the State Barley Test, 1992-93.*

Brand/Variety	Yield (Bu/A)	Test Weight (Lb)	Date Headed (Mar 31+)	Height (In)	Lodging (0 - 100 %)	Leaf Rust (%)**
	(5)	(5)	(3)	(3)	(5)	(2)
CALLAO	112	52.0 +	22 -	36 -	56 +	21 -
BOONE	95 -	47.8 -	30 +	44	74 +	40
PAMUNKEY	115	52.5 +	24	40	29	37
NOMINI	121	47.2 -	23 -	43	26	27
STARLING	115	46.6 -	26	43	55 +	19 -
WYSOR	105	48.1 -	25	43	37	44 +
BARSOY	84 -	51.2 +	22 -	39 -	20	74 +
LSD (0.05)	11	1.3	1	2	15	10
Test Average	111	49.5	25	42	34	32

* The number in parentheses below column headings indicates the number of locations on which data are based. A plus or minus sign indicates a performance significantly above or below the test average, respectively.

** Disease severity was assessed based on percent (0 - 100%) leaf area infected.

Table 4. Summary of performance of entries in the State Barley Test, 1993-94.*

Brand/Variety	Yield (Bu/A)	Test Weight (Lb)	Date Headed (Mar 31+)	Height (In)	Lodging (0-100 %)	Leaf Rust (%)**	Scald (0-9)+	Winter Survival (0-100%)
	(6)	(6)	(4)	(4)	(5)	(1)	(2)	(2)
CALLAO	116	51.0 +	18 -	31 -	32 +	1	3	98
BOONE	114	50.3	24 +	37 +	44 +	20 +	1 -	95
PAMUNKEY	110	51.2 +	19 -	34 -	20	1	3	98
NOMINI	114	48.0 -	19 -	38 +	9	2	2 -	99
STARLING	123 +	48.7	22 +	37 +	10	1	1 -	98
WYSOR	113	49.8	21	37 +	11	2	2 -	97
LSD (0.05)	11	1.4	1	1	17	2	1	4
Test Average	111	49.5	21	36	15	2	3	96

* The number in parentheses below column headings indicates the number of locations on which data are based. A plus or minus sign indicates a performance significantly above or below the test average, respectively.

** Disease severity was assessed based on percent (0 - 100%) leaf area infected.

+ Disease severity was assessed based on a 0-9 scale, where 0=no disease and 9=near 100% leaf area infected.

Table 5. Summary of performance of entries in the State Barley Test, 1994-95.*

Brand/Variety	Yield (Bu/A)	Test Weight (Lb)	Date Headed (Mar 31+)	Height (In)	Lodging** (0.2-10)	Leaf Rust (0-9)+	Leaf Blotch (0-9)+	BYD Virus (0-9)+
	(6)	(6)	(4)	(4)	(3)	(3)	(1)	(1)
CALLAO	111	50.3 +	14 -	31 -	5.0 +	3	4 +	0 -
BOONE	100 -	46.7	24 +	37 +	8.0 +	5	1 -	2 +
PAMUNKEY	102 -	49.5 +	16 -	35	3.0	4	2 -	0 -
NOMINI	119	45.8 -	17 -	38 +	1.6	4	1 -	0 -
STARLING	115	45.3 -	20 +	37 +	0.7 -	2 -	2 -	0 -
WYSOR	110	46.0	20 +	37 +	2.5	7 +	1 -	3 +
LSD (0.05)	10	0.6	1	1	1.6	2	1	1
Test Average	112	46.5	19	35	2.7	4	3	1

* The number in parentheses below column headings indicates the number of locations on which data are based. A plus or minus sign indicates a performance significantly above or below the test average, respectively.

** Belgian Lodging Scale = Area x Intensity x 0.2. Area = 1-10, where 1 is barley unaffected and 10 is entire plot affected and Intensity = 1-5, where 1 is barley standing upright and 5 is barley lying totally flat.

+ Disease severity was assessed based on a 0-9 scale, where 0=no disease and 9=near 100% leaf area infected.

Table 6. Summary of performance of entries in the State Barley Test, 1991-95.

Brand/Variety	Yield (Bu/A)	Moist (%)	Test Weight (Lb)	Date Headed (Mar 31+)	Height (In)	Lodging (0-100%)	Leaf Rust (%)**
CALLAO	113	13.1	51.0	16	32	55	16
BOONE	100	13.9	48.0	24	39	60	33
PAMUNKEY	111	12.7	51.4	17	36	41	23
NOMINI	117	13.3	47.5	17	39	35	19
STARLING	118	13.6	47.4	20	39	48	12
WYSOR	108	12.9	48.2	19	38	38	35
BARSOY	83	12.1	50.4	15	36	37	53
Test Average	109	13.2	49.0	19	37	47	26

** Disease severity based on percent (0 - 100%) leaf area infected.

FORM APPROVED: OMB NO. 40-R3822

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK AND SEED DIVISION
BELTSVILLE, MARYLAND 20705

EXHIBIT C
(Barley)

OBJECTIVE DESCRIPTION OF VARIETY
BARLEY *(HORDEUM VULGARE)*

INSTRUCTIONS: *See Reverse.*

NAME OF APPLICANT(S)
Virginia Agricultural Experiment Station

ADDRESS *(Street and No. or R.F.D. No., City, State, and ZIP Code)*
Virginia Polytechnic Institute and State University
Blacksburg, VA 24061-0404

FOR OFFICIAL USE ONLY
PVPO NUMBER 9600260
VARIETY NAME OR TEMPORARY DESIGNATION Callao

Place the appropriate number that describes the varietal character of this variety in the boxes below.
Place a zero in first box (i.e. [0][8][9] or [0][9]) when number is either 99 or less or 9 or less.

1. GROWTH HABIT:

[3] 1 = SPRING 2 = FACULTATIVE WINTER 3 = WINTER [1] Early Growth: 1 = PROSTRATE 2 = SEMIPROSTRATE 3 = ERECT

2. MATURITY (50% Flowering):

[1] 1 = EARLY (California Mariout) 2 = MIDSEASON (Betzes) 3 = LATE (Frontier)

[8] No. of days *Earlier* than ..... [8]
[ ] No. of days *Later* than ..... [ ]
1 = BETZES 2 = CALIFORNIA MARIOUT 3 = CONQUEST 4 = DICKSON 5 = PIROLINE 6 = PRIMUS 7 = UNITAN 8 = Boone

3. PLANT HEIGHT (From soil level to top of head):

[1] 1 = SEMIDWARF 2 = SHORT (California Mariout) 3 = MEDIUM TALL (Betzes) 4 = TALL (Conquest)

[1][8] Cm. *Shorter* than ..... [8]
[ ][ ] Cm. *Taller* than ..... [ ]
1 = BETZES 2 = CALIFORNIA MARIOUT 3 = CONQUEST 4 = DICKSON 5 = PIROLINE 6 = PRIMUS 7 = UNITAN 8 = Boone

4. STEM:

[3] Exertion *(Flag to spike at maturity)*: 1 = 0 - 3 cm. 2 = 3 - 10 cm. 3 = 10 - 15 cm.
[1] Anthocyanin: 1 = ABSENT 2 = PRESENT

[0][3] NO. OF NODES (Originating from node above ground)

[1] Collar Shape: 1 = CLOSED 2 = V-SHAPED 3 = OPEN 4 = MODIFIED CLOSED OR OPEN
[1] Shape of Neck: 1 = STRAIGHT 2 = SNAKY 3 = OTHER (Specify) _____

5. LEAF:

[2] Basal leaf sheath *(seedling)*: 1 = GLABROUS 2 = PUBESCENT
[2] Position of flag leaf *(at boot stage)*: 1 = DROOPING 2 = UPRIGHT

[2] Waxiness: 1 = ABSENT (Glossy) 2 = SLIGHTLY WAXY 3 = WAXY
[1][4] MM. WIDTH (First leaf below flag leaf)

[1][5] CM. LENGTH (First leaf below flag leaf)
[1] Anthocyanin in leaf sheath: 1 = ABSENT 2 = PRESENT

6. HEAD: Basal Rachis Internode: short & curved Heads are nodding & nearly perpendicular to neck

[2] Type: 1 = TWO-ROWED 2 = SIX-ROWED
[3] Density: 1 = LAX 2 = ERECT (Not dense) 3 = ~~ERECT~~ (Dense)
AMM 15 July 1997 per letter
[4] Shape: 1 = TAPERING 2 = STRAP 3 = CLAVATE 4 = OTHER (Specify) Strap & Parallel
[2] Waxiness: 1 = ABSENT (Glossy) 2 = SLIGHTLY WAXY 3 = WAXY
[3] Lateral Kernels Overlap: 1 = NONE 2 = AT TIP 3 = 1/4 - 1/2 OF HEAD
[3] Rachis *(Hair on edge)*: 1 = LACKING 2 = FEW 3 = COVERED

7. GLUME:

[1] Length: 1 = 1/3 OF LEMMA 2 = 1/2 OF LEMMA 3 = MORE THAN 1/2 OF LEMMA
[3] Hairs: 1 = NONE 2 = SHORT 3 = LONG
[3] Hair covering: 1 = NONE 2 = RESTRICTED TO MIDDLE 3 = CONFINED TO BAND 4 = COMPLETELY COVERED
[1] Awns: 1 = LESS THAN EQUAL TO LENGTH OF GLUMES 2 = EQUAL TO LENGTH OF GLUMES 3 = MORE THAN EQUAL TO LENGTH OF GLUMES
[3] Awn Surface: 1 = SMOOTH 2 = SEMISMOOTH 3 = ROUGH

9600260

8. LEMMA: Intermediate Awn length: Longer than that of Boone--shorter than Pamunkey

[5] Awn: 1 = AWNLESS 2 = AWNLETS ON CENTRAL ROWS, AWNLESS ON LATERAL ROWS 3 = SHORT ON CENTRAL ROWS, AWNLETS ON LATERAL ROWS 4 = SHORT (less than equal to length of spike) 5 = LONG (longer than spike) 6 = HOODED

[4] Awn Surface: 1 = AWNLESS 2 = SMOOTH 3 = SEMISMOOTH 4 = ROUGH
Several teeth on lateral & Marginal nerves

RECEIVED
USDA-AMS-PVPO

[2] Teeth: 1 = ABSENT 2 = FEW 3 = NUMEROUS

[2] Hair: 1 = ABSENT 2 = PRESENT Inside the lemma

[1] Shape of base: 1 = DEPRESSION 2 = SLIGHT CREASE 3 = TRANSVERSE CREASE

[2] Rachilla Hairs: 1 = SHORT 2 = LONG

'96 FEB 14 A9:30

9. STIGMA:

[ ] Hairs: 1 = FEW 2 = MANY

10. SEED:

[2] Type: 1 = NAKED 2 = COVERED

[1] Hairs on Ventral Furrow: 1 = ABSENT 2 = PRESENT

[3] Length: 1 = SHORT (8.0 mm.) 2 = SHORT TO MIDLONG (7.5 - 9.0 mm.) 3 = MIDLONG (8.5 - 9.5 mm.) 4 = MIDLONG TO LONG (9.0 - 10.5 mm.) 5 = LONG (10.0 mm.)

[4] Wrinkling of hull: 1 = NAKED 2 = SLIGHTLY WRINKLED 3 = SEMIWRINKLED 4 = WRINKLED

[1] Aleurone Color: 1 = COLORLESS (White or Yellow) 2 = BLUE

[ ][ ] PERCENT ABORTIVE

[4][0] GMS. PER 1000 SEEDS

11. DISEASE: (0 = Not Tested, 1 = Susceptible, 2 = Resistant) *Moderately susceptible

[2] SEPTORIA	[2*] NET BLOTCH	[2*] SPOT BLOTCH	[2] POWDERY MILDEW
[0] LOOSE SMUT	[0] BACTERIAL BLIGHT	[0] COVERED SMUT	[0] FALSE LOOSE SMUT
[1] STEM RUST (Race QCC)	[1] LEAF RUST (Race 30)	[0] SCAB	[0] SCALD
[0] AY	[0] BSMV	[2] BYDV	[1] OTHER (Specify) Stripe Rust (Race 24)

12. INSECT: (0 = Not tested, 1 = Susceptible, 2 = Resistant)

[0] GREEN BUG	[0] ENGLISH GRAIN APHID	[0] CHINCH BUG	[0] ARMYWORM
[0] GRASS HOPPERS	[0] CERIAL LEAF BETTLE	[0] OTHER (Specify)	

HESSIAN FLY RACES: [0] GP [0] A [0] B [0] C [0] D [0] E [0] F [0] G

13. CHEMICAL (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

[0] DDT [0] OTHER (Specify)

14. INDICATE WHICH VARIETY MOST CLOSELY RESEMBLES THAT SUBMITTED:

CHARACTER	NAME OF VARIETY	CHARACTER	NAME OF VARIETY
Plant tillering		Seed size	
Leaf size		Coleoptile elongation	
Leaf color		Seedling pigmentation	
Leaf carriage			

REFERENCES: The following publications may be used as a reference aid for the standardization of character descriptions and terms used in this form:

1. Wiebe, G. A., and D. A. Reid, 1961, Classification of Barley Varieties Grown in the United States and Canada in 1958, Technical Bulletin No. 1224, U.S. Dept. of Agriculture.
2. Reid, D. A., and G. A. Wiebe, 1968, Barley: Origin, Botany, Culture, Winter Hardiness, Genetics, Utilization, Pests, Agriculture Handbook No. 338, U.S. Dept. of Agriculture. pp. 61 - 84.
3. Malting Barley Improvement Association, Milwaukee, Wisconsin, 1971, Barley Variety Dictionary.

COLOR: Nickerson's or any recognized color fan may be used to determine color of the described variety.

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Callao Barley

14D. Exhibit D: Additional Description of Callao

Callao is an early maturing, semidwarf, six-row winter feed barley with exceptional grain volume weight. Early growth is prostrate, and similar to Boone in this respect. Stems of Callao have straight necks with closed collars. The rachis is covered with hairs, and its basal internode is short and curved. Spikes are nodding, dense and parallel with overlapping lateral kernels. Glumes are one-third the lemma in length, and have long hairs in wide bands. Glume awns are rough and slightly shorter than the glumes in length. Lemma awns are rough and intermediate in length, being longer than those of Boone but shorter than those of 'Pamunkey'. The yellow lemmas have several teeth on lateral and marginal nerves with some hairs within the ventral surface. Lemmas have depressed bases and long-haired rachillas. The covered kernels are white, midlong, and wrinkled.

Callao is moderately resistance to the prevalent pathotypes of the causal organisms of powdery mildew (*Blumeria graminis* DC. f. sp. *hordei* Ém. Marchal), net blotch (*Pyrenophora teres* Drechs.), scald [*Rhynchosporium secalis* (Oudem) J. J. Davis], spot blotch [*Cochliobolus sativus* (Ito & Kuribayashi) Drechs. ex Dastur], septoria leaf blotch (*Septoria passerinii* Sacc.), and barley yellow dwarf. Callao is moderately susceptible to leaf rust (*Puccinia hordei* Otth) in the seedling stage, but has a moderate level of adult-plant resistance in the field.

Winter hardiness of Callao is moderate, being hardier than 'Pamunkey' but slightly less-hardy than 'Wysor'. Spike emergence of Callao is very early (105 d, Julian) and similar to 'Barsoy' (Table 6). Callao heads about 1 d earlier than 'Nomini' and Pamunkey, and 4 and 8 d earlier than 'Starling' and Boone, respectively. Plant height of Callao (81 cm) is 10 cm shorter than Barsoy and Pamunkey, and 18 cm shorter than Starling, Nomini and Boone. Straw strength of Callao is similar to Boone, but less than that of Barsoy, Nomini, Pamunkey and Starling. Grain yields of Callao in 27 trials conducted in Virginia from 1991 to 1995 have averaged 6075 kg ha^{-1} and were 11% higher than those of Boone and 3% lower than Nomini. Callao has an average grain volume weight of 656 kg m^3, which is 6% higher than those of Boone and Nomini. Performance data for Callao from trials conducted in Virginia from 1991 to 1995 are presented in detail in Tables 1-6.

Callao was evaluated for three years (1992-94) in the Uniform Winter Barley Yield Nursery, and has performed well in the mid-Atlantic and southeastern regions, particularly in Virginia, Georgia, North Carolina, South Carolina, Tennessee, and Texas.

REPRODUCE LOCALLY. *Include form number and date on all reproductions.*

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U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S)

Virginia Agricultural Experiment Station

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER

VA 90-41-14

3. VARIETY NAME

Callao

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*

Virginia Polytechnic Institute and State Univ.
College of Agriculture and Life Sciences
Blacksburg, VA 24061

5. TELEPHONE *(include area code)*

540-231-3766

6. FAX *(include area code)*

540-231-3431

7. PVPO NUMBER

9600260

8. Does the applicant own all rights to the variety? *Mark an "X" in appropriate block.* If no, please explain. [X] YES [ ] NO

9. Is the applicant *(individual or company)* a U.S. national or U.S. based company? If no, give name of country _____ [X] YES [ ] NO

10. Is the applicant the original owner? [X] YES [ ] NO *If no, please answer the following:*

a. If original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. national(s)?

[ ] YES [ ] NO *If no, give name of country* _____

b. If original rights to variety were owned by a company, is the original owner(s) a U.S. based company?

[ ] YES [ ] NO *If no, give name of country* _____

11. Additional explanation on ownership *(If needed, use reverse for extra space):*

PLEASE NOTE:

Plant variety protection can be afforded only to owners (not licensees) who meet one of the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.

2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.

3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definition.

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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Callao Barley

14E. Exhibit E: Basis of Applicant's Ownership

The owner of Callao barley is the Virginia Polytechnic Institute and State University, of which the Virginia Agricultural Experiment Station is a part. Employees charged with developing this new cultivar as a condition of their employment understand that ownership rests with Virginia Polytechnic Institute and State University pursuant to university policy on intellectual property.